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UNITED STATES DEPARTMENT OF AGRICULTURE
FOREST SERVICE

# FOREST PEST MANAGEMENT

3420
Report No. 85-8
May 1985

STATE & PRIVATE FORESTRY

INTERMOUNTAIN REGION

## THE 1984 WESTERN SPRUCE BUDWORM CONDITIONS IN SOUTHERN IDAHO AND PREDICTIONS FOR 1985

by

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### ABSTRACT

Based on aerial detection survey information, susceptible conifers on approximately 2.03 million acres of forest land in southern Idaho were visibly defoliated by western spruce budworm (WSBW) during 1984. Area of visible defoliation declined on the Boise, Challis, Payette, Targhee, and Salmon National Forests, and increased on the Caribou and Sawtooth National Forests.

To verify defoliation occurrence and to forecast WSBW activity in 1985, population evaluations were conducted at 373 sample points. Based on population evaluations, activity of this insect in older infestations on the Payette and Boise National Forests should decline, while activity in other areas should increase or remain static. Specific location of 1984 WSBW activity and that forecast for 1985 are discussed.

### INTRODUCTION

Acreage of conifers in southern Idaho forests visibly defoliated by western spruce budworm (WSBW), Choristoneura occidentalis Freeman, since 1952 is shown in Table 1. It has resulted in varying degrees of topkill and occasional understory mortality (Beveridge and Cahill 1984). Land managers are very concerned about this insect; where it is currently active and where it will be active next year. Thus aerial detection surveys of National Forest lands in southern Idaho were conducted by Forest Pest Management with cooperation

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Table 1. Acres of Defoliation by Western Spruce Budworm in Southern Idaho from 1952 through 1984.

| Year | Acres in Southern Idaho | Acres Treated | Pesticide Used | Source of Information | |
|---|---|---|---|---|---|
| 1952 | 1,000,000 | | | Johnson & Denton | 1975 |
| 1953 | 500,000 | | | " " | " |
| 1954 | 1,000,000 | | | " " | " |
| 1955 | 1,175,000 | 837,210 | DDT | " " | " |
| 1956 | 1,127,540 | 475,890 | DDT | " " | " |
| 1957 | 1,172,940 | 660,630 | DDT | " " | " |
| 1958 | 974,710 | | | " " | " |
| 1959 | 499,000 | | | " " | " |
| 1960 | 516,500 | | | " " | " |
| 1961 | 1,425,000 | | | " " | " |
| 1962 | 1,641,000 | | | " " | " |
| 1963 | 1,632,100 | 190,000 | DDT | " " | " |
| 1964 | 2,276,000 | 525,070 | DDT | " " | " |
| 1965 | 1,495,100 | | | " " | " |
| 1966 | 958,400 | | | " " | " |
| 1967 | 163,900 | | | " " | " |
| 1968 | 395,300 | | | " " | " |
| 1969 | 463,200 | | | " " | " |
| 1970 | 239,200 | | | " " | " |
| 1971 | 343,300 | | | " " | " |
| 1972 | 500,300 | | | USDA Forest Service | 1972 |
| 1973 | 224,100 | | | " " | 1973 |
| 1974 | 338,500 | | | " " | 1974 |
| 1975 | 614,200 | | | " " | 1975 |
| 1976* | 555,200 | | | " " | 1976 |
| 1977* | 644,200 | | | " " | 1977 |
| 1978* | 915,800 | | | " " | 1978 |
| 1979* | 1,113,200 | 139,000 | Carbaryl & Acephate | " " | 1979 |
| 1980* | 1,248,400 | | | " " | 1980 |
| 1981* | 1,228,200 | | | " " | 1981 |
| 1982* | 2,258,000 | | | " " | 1982 |
| 1983* | 2,375,500 | | | " " | 1983 |
| 1984* | 2,032,700 | | | | |

* Does not include defoliation in the wilderness and primitive areas of southern Idaho

from the Idaho Department of Lands to identify intensity and extent of current infestations. Population sampling was conducted to verify observations and to project WSBW activity in 1985.

## METHODS

Regional aerial detection surveys to detect WSBW and other insect activity were conducted on a drainage by drainage basis from low-flying fixed-wing aircraft during July and August. Most forested lands in southern Idaho, except lands within the River of No Return Wilderness, Seven Devils Wilderness, and Sawtooth Wilderness were surveyed. Location and intensity of defoliation were mapped as described by Beveridge and Knapp (1984).

A western spruce budworm pupae case sampling system, being developed by USDA Forest Service, Pacific Northwest Forest and Range Experiment Station scientists, was modified to evaluate potential for defoliation of susceptible hosts. While this system is perhaps somewhat less reliable than other survey systems, it is considerably less expensive than the more commonly used egg mass surveys. Based on previous use, reliability of the pupae case sampling system seems to be adequate for our purposes of verifying WSBW occurrence and of predicting general defoliation patterns for the following year.

During late August and early September, pupae case sampling was conducted on five National Forests in southern Idaho (Table 2). Sample point selection was based on accessibility, presence of host type, and aerially observed defoliation. At each point pupae cases on one 45-cm long, lower crown branch from each of 12 randomly selected host trees were counted. Based on total pupae case counts at any sample point, the following class limits were used to classify predicted defoliation in 1985: 0-4 cases equals 0-15% (light) defoliation; 17-47 cases equals 16-65% (moderate) defoliation; and more than 65 cases equals greater than 65% (heavy) defoliation.

## RESULTS AND DISCUSSION

Conifers on approximately 2,033,000 acres in southern Idaho were defoliated to some degree by WSBW during 1984. Compared to WSBW defoliation in 1983, this is a reduction of nearly 350,000 acres. Acreage of three intensities of defoliation (light, moderate, heavy) for each National Forest surveyed is shown in Figure 1.

Pupae case counts were made at 294, 20, 5, and 54 points on the Boise/Payette, Sawtooth, Salmon and Targhee National Forests respectively (Table 2). Forecasts for WSBW activity for sampled areas are shown in Table 2.

Following is a brief forest by forest summary of conifer defoliation by WSBW during 1984 and that expected for 1985 in southern Idaho forests:

Boise National Forest: Conifers on 786,000 acres were defoliated to some degree in 1984. Compared to defoliation noted in 1983, this is a reduction of 24,000 acres, most of which occurred east of Deadwood Reservoir near Whitehawk Basin.

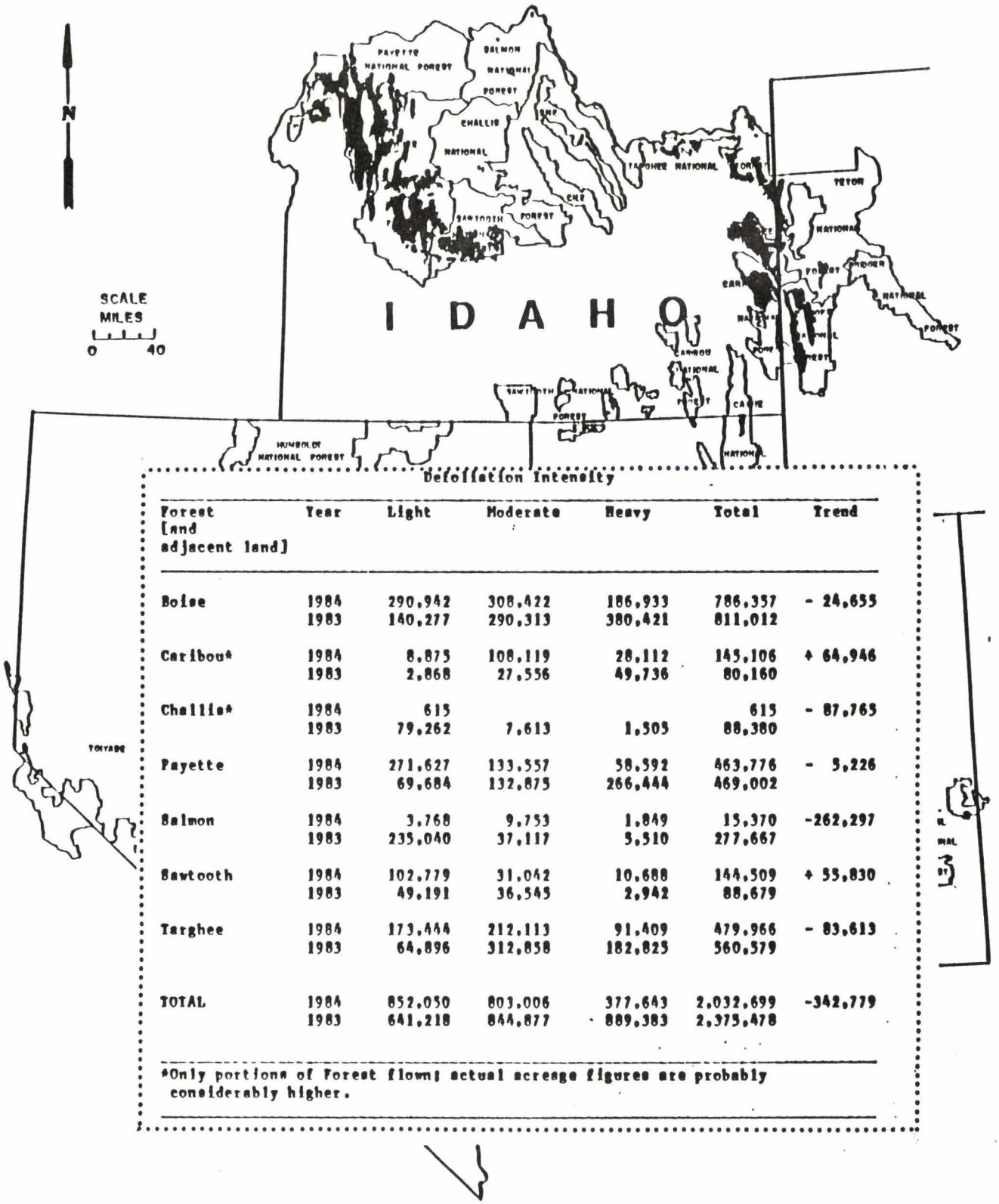
Table 2. Defoliation by WSBW Predicted for 1985 Based on Pupae Case Counts

| Area | Total Points Sampled | Predicted Defoliation Intensity | | |
|---|---|---|---|---|
| | | Light (0-15%) | Moderate (16-65%) | Heavy (+ 65%) |
| Boise and Payette National Forests[1] | | | | |
| Little Salmon River | 49 | 38 | 11 | 0 |
| Mores & Grimes Creeks[2] | 25 | 18 | 7 | 0 |
| Weiser River | 51 | 35 | 16 | 0 |
| North Fork Payette River | 76 | 64 | 12 | 0 |
| South Fork Payette River | 40 | 30 | 10 | 0 |
| Deadwood River[2] | 27 | 27 | 0 | 0 |
| North & Middle Fork Boise River | 26 | 7 | 19 | 0 |
| TOTAL | 294 | 219 | 75 | 0 |
| Sawtooth National Forest | | | | |
| South Fork of Boise River | 20 | 14 | 6 | 0 |
| Salmon National Forest | | | | |
| Salmon & North Fork Ranger Districts[2] | 5 | 4 | 1 | 0 |
| Targhee National Forest | | | | |
| Dubois Ranger District | 34 | 26 | 8 | 0 |
| Island Park, Ashton, Palisades, Teton Basin Ranger Districts | 19 | 7 | 12 | 0 |
| TOTAL--Southern Idaho | 372 | 270 | 102 | 0 |

[1]The Boise and Payette National Forests are grouped together because of the many common drainages.

[2]A third or more of the pupae cases showed signs of parasitism.

Figure 1. Extent and Intensity of Visible Defoliation by Western Spruce Budworm in Southern Idaho During 1984 as Determined by Aerial Detection Surveys




Defoliation Intensity

| Forest [and adjacent land] | Year | Light | Moderate | Heavy | Total | Trend |
|---|---|---|---|---|---|---|
| Boise | 1984 | 290,942 | 308,422 | 186,933 | 786,357 | - 24,655 |
| | 1983 | 140,277 | 290,313 | 380,421 | 811,012 | |
| Caribou* | 1984 | 8,875 | 108,119 | 28,112 | 145,106 | + 64,946 |
| | 1983 | 2,868 | 27,556 | 49,736 | 80,160 | |
| Challis* | 1984 | 615 | | | 615 | - 87,765 |
| | 1983 | 79,262 | 7,613 | 1,505 | 88,380 | |
| Payette | 1984 | 271,627 | 133,557 | 58,592 | 463,776 | - 5,226 |
| | 1983 | 69,684 | 132,875 | 266,444 | 469,002 | |
| Salmon | 1984 | 3,768 | 9,753 | 1,849 | 15,370 | -262,297 |
| | 1983 | 235,040 | 37,117 | 5,510 | 277,667 | |
| Sawtooth | 1984 | 102,779 | 31,042 | 10,688 | 144,509 | + 55,830 |
| | 1983 | 49,191 | 36,545 | 2,942 | 88,679 | |
| Targhee | 1984 | 173,444 | 212,113 | 91,409 | 479,966 | - 83,613 |
| | 1983 | 64,896 | 312,858 | 182,825 | 560,579 | |
| TOTAL | 1984 | 852,050 | 803,006 | 377,643 | 2,032,699 | -342,779 |
| | 1983 | 641,218 | 844,877 | 889,383 | 2,375,478 | |

*Only portions of Forest flown; actual acreage figures are probably considerably higher.

A substantial reduction in defoliation intensity was noted in grand fir stands, which have sustained several years of moderate or heavy defoliation. Greatest reduction in defoliation intensity occurred along the West Mountains, in the Gold Fork River drainage, and throughout Clear Creek east of Cascade. Areas of relatively recent defoliation, mostly in Douglas-fir stands on the Idaho City, Mountain Home, and Boise Ranger Districts continued to be moderately or heavily defoliated. New areas of defoliation were recorded near Thorn Creek Butte and Rocky Bar.

Population evaluations suggest a continuing decrease in the intensity of WSBW activity throughout the Forest. The most significant reductions in intensity should occur throughout the North Fork of the Payette River area.

Total acreage infested by WSBW should also decline with most reductions occurring in grand fir stands on the Emmett and Cascade Ranger Districts.

Caribou National Forest: Douglas-fir and subalpine fir were again defoliated throughout the Caribou Basin area. Although area of defoliation increased from approximately 80,000 acres in 1983 to 145,000 acres in 1984, defoliation intensity generally decreased. Actual defoliated acreage on the Forest may be substantially higher since only the area north of Tincup Creek has been surveyed in recent years.

Population sampling was not conducted during 1984; however, field observations in the Caribou Basin area suggest that WSBW activity will continue throughout areas of susceptible host type.

Challis National Forest: Only 615 acres of defoliation were observed in 1984 compared to over 88,000 acres in 1983. Defoliation may be present in other areas of the Forest, but were not mapped since only the main Salmon River drainage is aerially surveyed. Defoliation occurred in the Muley and Gardner Creek drainages north of the Salmon River.

Because of the small amount of defoliation observed during aerial detection surveys, population sampling was not conducted.

Payette National Forest: Hosts on approximately 463,000 acres exhibited some degree of visible defoliation in 1984. This compares with approximately 468,000 acres of defoliation in 1983.

Significant reductions in defoliation intensity occurred throughout grand fir stands which have been moderately or heavily defoliated for substantial lengths of time. Areas with reduced amounts of defoliation intensity by WSBW include: The Boulder Creek drainage, and throughout the North Fork of the Payette River drainage. Increases in defoliation intensity occurred in the Cuddy Mountain area in recently infested Douglas-fir stands.

Population evaluations suggest that defoliation intensity and extent will continue to decline in 1985 especially in areas where chronic WSBW activity has occurred. These areas include the Little Salmon River, Weiser River, and North Fork of the Payette River drainages.

Salmon National Forest: About 15,000 acres of hosts were defoliated by WSBW during 1985. Hosts on over 277,000 acres were defoliated in 1983. The massive decline in activity is likely attributed to adverse climatic conditions during

critical phases of the WSBW's life cycle. Remnant isolated infestations were active in Douglas-fir stands along Panther and Moyer Creeks on the Cobalt Ranger District, and Wallace and Moose Creeks on the North Fork Ranger District. Moderate to heavy defoliation was recorded on over 8,000 acres of Douglas-fir along Big Creek and near Gilmore Summit on the Salmon Ranger District.

Population sampling indicates, that while a WSBW population is present, defoliation intensity levels should remain very low. Outbreak area should continue to decline during 1985.

Sawtooth: Douglas-fir and true fir were defoliated throughout substantial areas of the Sawtooth National Forest. Approximately 144,500 acres were visibly defoliated by WSBW--an increase of 55,000 acres from 1983. Most of this increase is attributed to new, light intensity infestations, primarily affecting Douglas-fir in the Albion, Raft River, and Black Pine areas on the Burley Ranger District. Elsewhere defoliation was concentrated throughout the South Fork of the Boise River drainage and in portions of the Big Wood River drainage on the Fairfield and Ketchum Ranger Districts respectively.

Population evaluation indicates that WSBW activity on the Fairfield and Ketchum Ranger Districts will continue near 1984 levels with most defoliation being located in the South Fork of the Boise River drainage. Infestations on the Burley Ranger District were not sampled during 1984.

Targhee National Forest: Hosts on approximately 477,000 acres were defoliated during 1984--a decline of 83,000 acres from 1983. All of this decline was found in Douglas-fir and subalpine fir stands along the Centennial Mountains on the Dubois Ranger District.

Decreases in intensity of the WSBW defoliation were evident along the Teton and Big Hole Mountains; increases in defoliation intensity were observed along Big Bend Ridge near Island Park Reservoir.

Based on population sampling, WSBW activity during 1985 should be similar to that observed in 1984. Heaviest defoliation will remain south of Island Park Reservoir, along the Teton Mountains and throughout the Big Hole Mountains. Only scattered pockets of light defoliation should occur along the Centennial Mountains.

## MANAGEMENT ALTERNATIVES

Maintain Present Management: The infestation would be allowed to continue, likely for 7-10 years until natural abatement occurs. Short-term resource impacts including growth loss, topkill, some understory mortality, and reduced seed production would be accepted.

Direct Suppression: One or more available registered insecticides, carbaryl, acephate, malathion, or *Bacillus thuringiensis* Berliner, a microbial insecticide, would be applied either to the entire infestation or to a portion thereof. Approximate costs would be $10 to $15 per acre. Short-term impacts to the various resources would be reduced significantly for a 3-4 year period, after which the population would likely return to presuppression levels.

Because treatment would preserve the food base, a chronic infestation could develop, particularly if suppression is undertaken whenever the population resurges to damaging levels.

Silvicultural Management: Stands susceptible to WSBW activity would be managed to reduce potential for damage. Management treatments include:

(1) Favoring a diversity of site-suited seral host species.

(2) Maintaining or improving vigor of a stand by conducting timely thinnings and selecting against trees affected with other damage agents including dwarf mistletoe and root/stem decays.

(3) Harvesting susceptible stands at maturity using even-age regeneration systems.

Silvicultural management is a long-term approach directed towards reducing the effects of future outbreaks. During the current infestation, such management would benefit only those stands treated.

## RECOMMENDATIONS

To deal with WSBW infestations, an integrated approach is recommended with silviculture management being the base program. Stands with highest value and potential for impact should be treated first.

Direct suppression may be considered in high-value young stands, and in recreation and seed production where short-term protection is desirable and economically feasible.

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